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Sandtoft

The Zonal Method User's Guide

Roof Tile Fixing Specification

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CTMA
Concrete Tile Manufacturers Association

Clay Roof Tile Council

NFRC
The National Federation of Roofing Contractors Limited
COLLECTIVE MARK

Foreword

In the UK roof designers and contractors must currently determine the appropriate level of fixings for roofing tiles and fittings by calculation. The methodology is complex and in practice is generally carried out by the roof tile manufacturer.

The *Zonal Method* was developed by an industry-wide group comprising representatives from NFRC, CTMA, CRTC as well as support from BRE, NBS, NHBC and Zurich. It marks a long-awaited simple and common approach to determining roof tile fixings. Instead of having to carry out calculations for every project, predicted maximum wind loadings have been pre-calculated and placed in a common set of tables. Each manufacturer has then compared the resistance to wind uplift of their tiles and fixings; ie nails & clips, against these wind loadings to determine the appropriate level of fixings to produce Zonal fixing tables for each tile. The benefit of this system is that it offers a safe and robust fixing specification without the need for further calculation.

With just some very basic information about the roof and site location the designer or contractor can use the *Zonal Method* tables to look up a suitable fixing specification for a project. This saves time in not having to submit an enquiry to Sandtoft Technical Support for each project.

In this Guide Sandtoft outlines the scope of the *Zonal Method* and assists the reader through the process of using the Zonal tables, as well as providing recommendations for hips, ridges, verges, valleys, penetrations and openings.

For projects or tile types that fall outside the scope of the *Zonal Method,* or where it is necessary to apply individual parameters in accordance with BS 5534, Sandtoft Technical Support can still provide individual site-specific fixing recommendations using the full calculation method.

John Mercer MIoR
Technical Manager
Sandtoft Roof Tiles

Introduction

The Zonal Method is a method for obtaining a fixing specification for roof tiles and is a simplification of the calculations defined in BS 5534[1], 'Code of practice for slating and tiling (including shingles)'. The assumptions made in the simplification process may produce a specification with more or stronger fixings than that required if the full BS 5534[1] calculation is undertaken.

Manufacturers of roof tiles will provide fixing tables for their products in accordance with the Zonal Method. With some basic information about the design of roof tile to be used, the building and the site topography, the manufacturers' fixing tables will provide a fixing specification without the need for complex calculations. All manufacturers' fixing tables follow the same layout, Sandtoft's tables are given in Appendix B.

Scope

Included in the scope of this guide are roofs covered with single-lap and double-lap clay and concrete roof tiles including ridges, hips, verges and valley junctions (for exclusions see Appendix C).

Designers, specifiers and users are advised to check that the manufacturers' fixing tables refer to tiles, fittings and accessories that are manufactured to the appropriate British or European Standard or supported by recognised UKAS-accredited third-party assessment.

Where reference is made to the fixing specifications of proprietary products and to manufacturers' recommendations, the specifier should obtain evidence that these fixing specifications and recommendations have been proven by relevant experience or relevant test method data based on the conditions and methods of use in the UK climate to be fit for purpose.

In cases where the fixing specifications concerning the use of proprietary products varies from those contained in BS 5534[1], it is essential that the manufacturer's recommendations give the designer and user adequate assurance of performance. It is advisable that the designer, specifier, or, user seeks assurances at the design stage of a project that such recommendations are appropriate for the intended application.

How to use the Zonal Method

1. Information required

To use the Zonal Method the following information is required:

1. The manufacturer's name and model of roof tile to be used.

2. The altitude of the site (less than 100m, 100 to 200 m, over 200 m but less than 300m).

3. The wind speed zone in which the building lies (1, 2, or, 3). This can be obtained from the map given in Appendix A.

4. The height of the building (less than or equal to 5m, 10m, or, 15m).

5. The pitch of the roof (e.g. for single lap tiles less than 35° ; 35° - 44°; or, 45° - 54°; for double lap 35° - 59°).
   Note: The tile manufacturer should be consulted to determine the minimum pitch for the tile selected. Roofs with long rafters may be subject to additional pitch restrictions.

6. The headlap requirement for single lap tiles (75mm or 100mm)

7. If counter-battens are to be used.

2 Manufacturers' Fixing Tables

For each tile type two sets of Tile Fixing Specification tables will be available from the manufacturer:

Tiles fixed to battens only; and
Tiles fixed to battens over counter-battens.

Both will require that all perimeter tiles are fixed, including tiles adjacent to valleys and, where appropriate, verge specifications will be provided. The tile fixing specification will be in accordance with the following format:

Zonal Fixing specification	Single lap tiles	Double lap tiles
A	No fixings required (except perimeters)	Not Applicable
B	Each tile once nailed (right hand nail hole – flat tiles)	Each tile twice nailed every fifth course
C	Each tile twice nailed (flat tiles only)	Each tile twice nailed every fourth course
D	Each tile clipped	Each tile twice nailed every third course
E	Each tile once nailed and clipped	Each tile twice nailed every second course
F	Each tile twice nailed and clipped	Each tile twice nailed
Note 1 The manufacturers shall base their Zonal fixing specifications on the Zonal Method Technical Reference[2] developed by the CTMA and the CTRC. The manufacturers shall ensure that the specifications are appropriate for their products.		
Note 2 The manufacturer may also specify the use of improved nails (e.g. ring shank nails) for fixing tiles. Where these are required the Zonal Method fixing specification letter will be marked with an asterisk, e.g. C*.		
Note 3 The Zonal Method calculations are based on the use of substructures that provide a shielding factor of 1, e.g. flexible underlays and rigid underlays, including, board sarking, liner trays and sandwich panels.		
Note 4 The manufacturers may define additional fixing specifications to those in the table and assign fixing specification letters from G onwards. In some cases the manufacturer may specify a 'proprietary system' and this will be marked PS and the manufacturer should be contacted for the details of the fixing method.		

3 How to use the Manufacturers' Tile Fixing Tables

Check that the table to be used is the current version from the manufacturer of the roof tile that is to be fitted.

The following sequence should be used:

(1) Within the appropriate manufacturer's table, identify the sub-table relevant to the site's altitude. e.g. less than 100 m; 101 to 200 m; or, 201 to 300m.

(2) Within the altitude sub-table identify the wind speed zone appropriate for the site location (Zone I, 2, or, 3). This can be obtained from the map given in Appendix A.

(3) Identify the building height to ridge (5m, 10m, 15m).

(4) For single lap tiles identify the headlap column (75 or 100mm). Where the headlap falls between 75 mm and 100 mm use the 75 mm fixing specification for the designated lap.

(5) For single lap tiles identify the roof pitch column (less than 35°; 35°- 44°; or, 45° - 54°).

(6) For plain tiles identify the roof pitch column (e.g. 35° - 59°).

(7) The fixing specification can then be obtained, e.g. A to F.

Hips, Hip-Ridges, Ridges, Verges, Valley Junctions, Penetrations and Openings

Hips (bonnets, arris and purpose-made fittings for plain tiles)

Hips should be installed in accordance with BS 5534[1], BS 8000-6[3] and the manufacturer's instructions.

Individual bonnet, arris and purpose made hip tiles to be used in each course with double-lap plain tiles should be mechanically fixed with nails, and head bedded to prevent uplift.

Hip-Ridges, Ridges, Verges and Valley junctions

Ridges should be installed in accordance with BS 5534[1], BS 8000-6[3] and the manufacturer's instructions.

The mechanical fixing of all hip ridges and ridges is recommended. But in all cases, to comply with BS 5534[1] and BS 8000-6[3], hip-ridge or ridges should be mechanically fixed for a distance of not less than two consecutive units or a distance of 900 mm, whichever is the greater, from the face of rigid masonry supports such as gables, dormers, valley junctions, abutments and separating walls where there is a risk that differential movement may take place.

All verge tiles or verge components, should be clipped (single lap tiles), or twice nailed (double lap plain tiles), or secured by using a proprietary dry verge system.

All methods used for the mechanical fixing of hip ridges, ridges and verges should meet the requirements of BS 5534[1] and BS 8000-6[3], including proprietary 'dry fix' systems, which should be fixed strictly in accordance with the selected manufacturer's instructions.

Roof penetrations and openings (ie roof windows, chimneys)

Consideration should be given to the location of any penetrations and openings in the roof to facilitate the optimum tile module so as to avoid small cut tiles. All tiles adjacent to roof penetrations or openings should be mechanically fixed.

References

1. BS 5534, Code of practice for slating and tiling (including shingles), British Standards Institution, 2003
2. Zonal Method Technical Reference CRTC / CTMA 2006
3. BS 8000–6, Workmanship on building sites – Code of practice for slating and tiling of roofs and claddings, British Standards Institution, 1990
4. BS 6399–2, Loading for buildings – Code of practice for wind loads, British Standards Institution, 1997

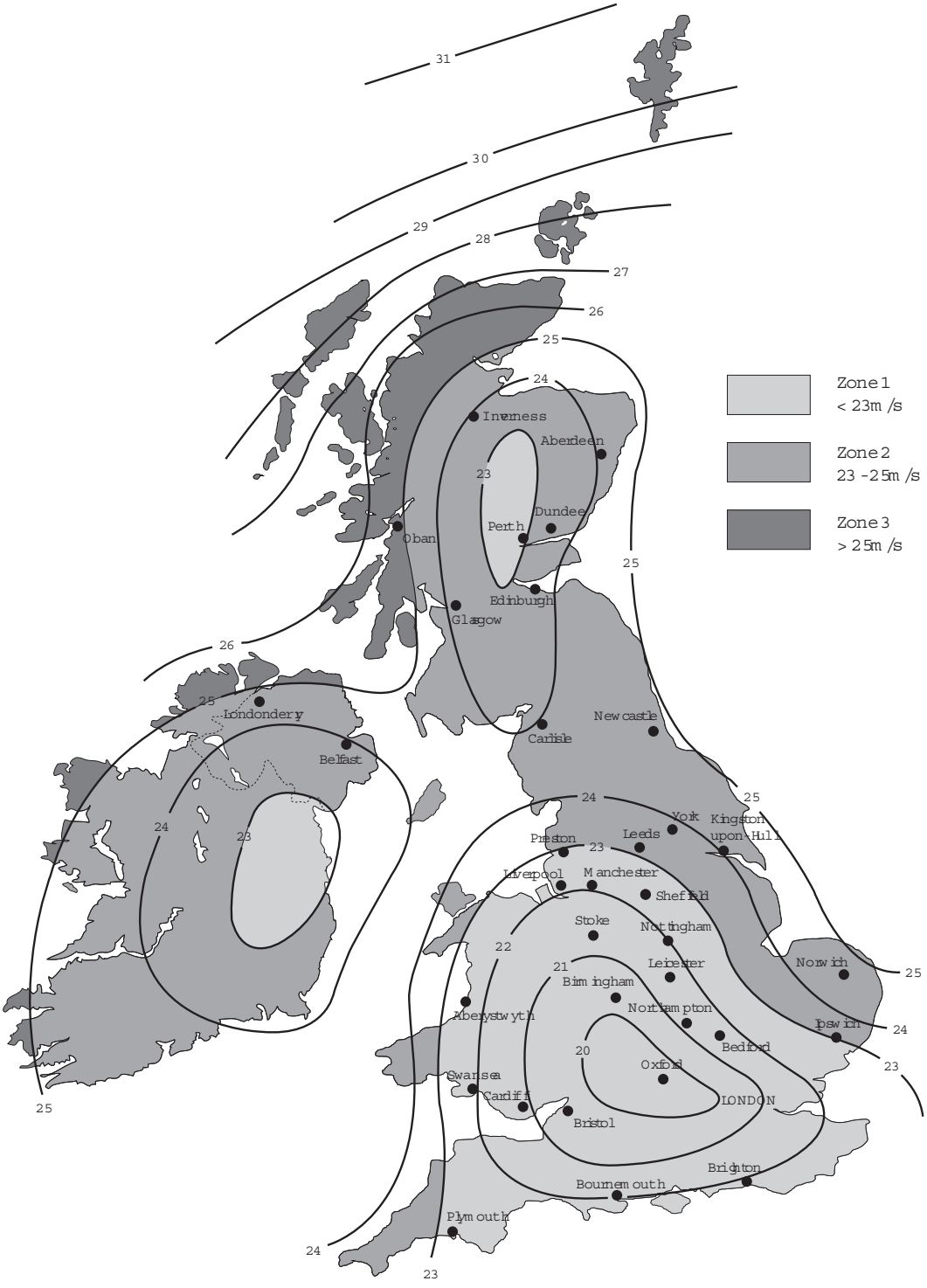
Further Guidance

Practical guidance on the application of single-lap and double-lap tiling can also be obtained from CITB/CS Trainer Resource Package for Operatives in the Construction Industry Manuals', Construction Industry Training Board, 2002:

CTP 036/1 – Roof Slating and Tiling – Common Materials and Methods;
CTP 036/2 – Roof Slating and Tiling – Single–lap, Variable Gauge, Interlocking Tiles;
CTP 036/3 – Roof Slating and Tiling – Double-lap, Variable Gauge, Plain Tiles;
CTP 036/5 – Roof Slating and Tiling – Single-lap, Fixed Gauge, Interlocking and mitred tiles.

UK Map of Three Wind Speed Zone

Appendix A



For the Channel Islands assume a wind speed of 24 m/s i.e. Zone 2

If the building lies on the junction of 2 wind speed zones use the higher wind speed zone when determining the fixing specification in accordance with the Zonal Method.

Map reproduced by kind permission of BRE Ltd

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Double Pantiles - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Double Pantiles - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	X	D	E	X	D	E
15 m	X	D	E	X	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Calderdale Slates - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	C*	E	D	C*	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Calderdale Slates - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Dual Calderdale - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	C*	E	D	C*	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Dual Calderdale - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	E	E	E	E	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	E	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	E	E	E	E	E
15 m	E	E	E	E	E	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
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- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Double Roman - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
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* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Double Roman - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
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10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E*	D	E	X	D	E
15 m	X	D	E	X	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Bold Roll - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Bold Roll - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E*	D	E	E*	D	E
15 m	E*	D	E	E*	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 2						
5 m	E	D	E	E*	D	E
10 m	X	D	E	X	D	E
15 m	X	D	E	X	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Lindum Tiles - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Lindum Tiles - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E*	D	E	E*	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Standard Pattern Tiles - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Standard Pattern Tiles - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Shire Pantiles - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Shire Pantiles - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Olympus - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Olympus - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E*	D	E	E*	D	E
15 m	X	D	E	X	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped
- X Wind uplift force exceeds tile resistance (contact Sandtoft's Technical Team on **0870 1452021**)

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Cassius - without counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Cassius - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	E	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 2						
5 m	E	D	E	E	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

20/20 - <u>without</u> counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	B*	E	D	B*	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

20/20 - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	E	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
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- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Neo Pantile - <u>without</u> counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
- C Each tile twice nailed (flat tiles only)
- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

SANDTOFT ROOF TILE FIXING SPECIFICATIONS - ZONAL METHOD

Neo Pantile - with counterbattens

Site altitude: 0 - 100 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 100 - 200 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: 200 - 300 m

Headlap	75 mm			100mm		
Pitch	Below 35º	35-44º	45-55º	Below 35º	35-44º	45-55º
Zone 1						
5 m	D	D	E	D	D	E
10 m	D	D	E	D	D	E
15 m	D	D	E	D	D	E
Zone 2						
5 m	D	D	E	D	D	E
10 m	E	D	E	E	D	E
15 m	E	D	E	E	D	E
Zone 3	For Zone 3 calculation to BS 6399 and BS 5534 is required.					

Site altitude: > 300 m

Calculation to BS 6399 and BS 5534 is required.

Zonal fixing specifications

Key

- A No fixings required
- B Each tile once nailed (right hand hole on flat tiles)
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- D Each tile clipped
- E Each tile once nailed and clipped
- F Each tile twice nailed and clipped

* = Improved Nail

List of Exclusions Appendix C

The Zonal Method is not applicable in the following circumstances:

- For buildings where the site altitude is greater than 300m.
- For buildings on sites where the maximum gradient of the land within 200 m of the building is greater than 10%.
- Where the building is within 6 kilometres of an airport and is plus or minus 10 degrees each side of the runway centre line measured from the touchdown point.
- Where the ridge height of the building is greater than 15 m.
- Where the roof pitch is greater than 54^0 for single lap tiles and 59^0 for double lap tiles.
- For buildings where the roof substructure does not provide a shielding factor of 1 as defined in BS 5534[1] e.g. the roof does not have an underlay or sub-roof system such as liner trays or sandwich panels.
- For tiles or slates not made of concrete or clay.
- Heritage, listed or historic buildings requiring restoration using traditional skills.
- For buildings on sites located in wind zones where the wind speed is greater than 25 m/s i.e. Zone 3.

The fixing specification for the roof covering of any excluded site or building must be determined by calculation in accordance with the methods described in BS 5534[1] and BS 6399-2[4]. For example, in some extreme cases, special nails or clips may be required.

This Users Guide is a joint publication prepared by the technical committees of the Concrete Tile Manufacturers' Association, Clay Roof Tile Council, and the National Federation of Roofing Contractors.

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Sandtoft

CAMPAIGNING FOR BEAUTIFUL ROOFS

Tile colours shown in this brochure are as accurate as the printing process will allow.
Product samples are available upon request.
At Sandtoft we are continually innovating and improving our product range.
We reserve the right to change product specifications without notice.
Please contact our Customer Support Team for the latest information or visit **www.sandtoft.com**

Community registered design application No. 000165840
UK patent pending: application No. 0407835.8
European patent pending: application No. 05252150.7